GENERAL MONITORS

Protection for life.

MODEL TA202A

Zero Two Series
Trip Amplifier Module
for Hydrogen Sulfide Gas Applications

INSTRUCTION MANUAL 07/97

Part No. MANTA202A
Revision F/07-97

Warranty Statement

General Monitors warrants the *Model TA202A* to be free from defects in workmanship or material under normal use and service within two (2) years from the date of shipment. General Monitors will repair or replace without charge any such equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective or damaged equipment will be made by General Monitors' personnel. Defective or damaged equipment must be shipped prepaid to General Monitors' plant or the representative from which shipment was made. In all cases this warranty is limited to the cost of the equipment supplied by General Monitors. The customer will assume all liability for the misuse of this equipment by its employees or other personnel. All warranties are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without General Monitors' approval or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered. Except for the express warranty stated above, General Monitors disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of General Monitors for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.

Warnings

- HYDROGEN SULFIDE GAS IS AN EXTREMELY TOXIC GAS AND EXPOSURE MAY RESULT IN A LOSS OF CONSCIOUSNESS OR DEATH.
- All Zero Two Series Modules contain components which can be damaged by static electricity. Special care must be taken when wiring the system to ensure that only the connection points are touched.
- Smart Sensors designed by General Monitors will work with the Model TA202A. Any attempt to use a Field Device that has not been designed and approved by General Monitors will void the warranty.
- **SAFE TY WARNING: Installation and Maintenance must be carried out by suitably skilled and competent personnel only.**
- Full backwards compatibility can be specified at the time of order. If this configuration is specified, the rear terminal output designation will be identical to the previous generation of Zero Two Series Modules.
- This generation of product can be distinguished from the previous generation by the lack of a door on the front panel. Adjustments are not necessary on the current generation of this product.

Number

7 Appendix

Illustrations

This chapter provides a brief description of the Model TA202A, its features & benefits and a list of some of its applications. More detailed information on the features and benefits listed in section 1.2 will be presented in later chapters.

1.1 General Description

The General Monitors Model TA202A (see figure 1) is a single channel Hydrogen Sulfide Gas Trip Amplifier designed for use in Zero Two Series Gas and Flame Detection Systems. This Module connects to the wires from a field mounted General Monitors Smart Sensor which monitors hydrogen sulfide gas leaks.

The Model TA202A is electrically and physically compatible with the other gas detection, flame detection and system modules in the Zero Two Series. It is distinguished from the other modules by its yellow border and "TA202A" in the upper right corner of the front panel. The Model TA202A is designed for use in non-hazardous environments.

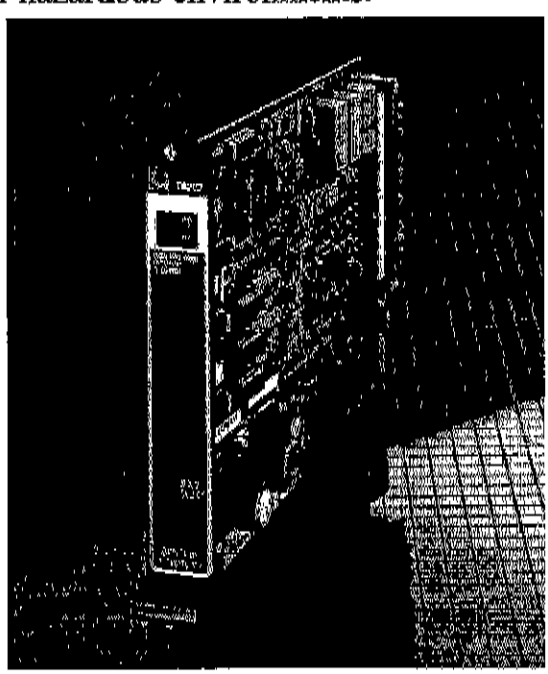


Figure 1

1.2 Features & Benefits

Microprocessor Based Electronics: monitors fault conditions, sensor inputs and provides outputs in the form of display codes, analog signal, relay contact and open collector activations.

Setup Mode: allows the user to set parameters such as alarm output options, test options, etc. These parameters are viewed on the display during the Setup Mode.

Password Option: prevents unauthorized alteration of the setup parameters (can be disabled).

Setup Check Mode: allows the user to view the parameters that have been set by the factory and/or an operator.

LED Test: tests the integrity of each display LED and each segment of the digital display on the front panel.

Card Test: tests the functionality of the card through the microprocessor ramping up the signal from 0 to full scale.

Live Insertion/Removal: allows the user to insert or remove a module while power is applied to the system without damage to any of the components in the system.

1.3 Applications

The General Monitors Model TA202A is a Trip Amplifier designed for Zero Two Series Hydrogen Sulfide Gas Applications. Below is a partial list of applications:

- Refineries
- Drilling platforms and rigs
- Gas and oil production platforms
- Gas collection facilities
- Oil well logging operations
- Sulfur recovery plants
- Desulfurization facilities
- Sewage disposal and treatment plants
- Chemical plants

This chapter provides detailed specifications for the Model TA202A Zero Two Series Trip Amplifier Module. System, mechanical, electrical and environmental specifications present the Model TA202A in technical terms. The engineering specification provides a written specification that can be inserted into another document by architects and engineers.

2.1 System Specifications

Application: Hydrogen Sulfide (H_2S) Gas Detection.

Sensor Type: General Monitors' Hydrogen Sulfide Gas Smart Sensors.

Measuring Ranges (*in parts-per-million*): 0 to 99 ppm, 0 to 50 ppm or 0 to 20 ppm.

Approvals: CSA certified to the ISA S12.15 Part I, 1990 performance standard for hydrogen sulfide gas detection instrumentation.

Warranty: Two years.

Performance Accuracy: ±2 ppm or ±10% of the applied gas, whichever is greater, at reference ambient conditions (field device).

Response Time: T50 ≤ 1 minute with full scale concentration applied to sensors with wire screen flame arrestors. T50 ≤ 2 minutes with full scale concentration applied to sensors with sintered flame arrestors (field device).

Temperature Variation: ±4 ppm or ±10% of the applied gas, whichever is greater over a -40°C to +60°C temperature range (field device).

Humidity Variation: ±4 ppm or ±10% of the applied gas, whichever is greater over a 15% to 90% relative humidity range (field device).

Long Term Stability: ±4 ppm or ±10% of the applied gas, whichever is greater over a 21 day period (field device).

2.2 Mechanical Specifications

Weight:	11.2 oz.	(318 grams)
Length:	9.9 inches	(251 mm)
Height:	6.825 inches	(173 mm)
Width:	1.0 inch	(25 mm)

2.3 Electrical Specifications

Input Power Requirement: 20 to 35Vdc @ 300mA max. (24Vdc, 7W nominal).

Electrical Classification: General Monitors' Smart Sensors are rated for use in Class I, Division 1, Groups B, C & D. The Model TA202A is designed for use in non-hazardous environments.

Relay Contact Rating: 4A @ 250Vac, 3A @ 30Vdc resistive maximum. DPDT for A1 & A2, SPDT for Fault.

Open Collector Rating: 100mA @ 35 Vdc for A1, A2, Fault, UA, FUA, CAL-OC, LA1 & LA2.

Cable Parameters: Recommended 3 wire shielded, maximum cable lengths allowable between module and the Field Device with 24Vdc nominal at the sensor/detector:

AWG	Feet	Meters
14	4500	1372
16	2250	685
18	1600	488
20	1100	335
22	750	228

Cable Parameters (*continued*)

The maximum allowable cable lengths between the analog output connections on the control module with a remote device in series (maximum loop resistance of 300 Ohms between AO+ & AO-, including any load):

AWG	Feet	Meters
14	9000	2740
16	5200	1585
18	3800	1160
20	2400	730
22	1600	488

2.4 Environmental Specifications

Operating Temperature Range:

Field -40°F to +140°F
Device -40°C to +60°C

TA202A 0°F to +150°F
-18°C to +66°C

Storage Temperature Range:

Field -40°F to +167°F
Device -40°C to +70°C

TA202A -40°F to +150°F
-40°C to +66°C

Operating Humidity Range:

5% to 100% Relative Humidity, non-condensing

2.5 Engineering Specifications

Zero Two System - Each system shall utilize modules capable of monitoring gas sensing elements or a 0 to 21.7mA analog signal from gas or flame detection transmitters. The system chassis shall be available in 4, 8 and 16 channels. Each chassis shall contain a bus for the following independent signals: A1 Alarm, A2 Alarm, Fault, Master Reset, Master Accept, Unaccept, CAL, +24Vdc and System Common. Module signals shall be capable of being bussed from one chassis to another, so that up to 100 modules can comprise a single system. The gas and flame detection modules shall be electrically and physically compatible and capable of being used in the same chassis to form combined fire and gas detection systems. The system shall consist of Zero Two Series component modules as manufactured by General Monitors, Lake Forest California, U.S.A. or General Monitors, Galway, Ireland.

TA202A Trip Amplifier Module - The trip amplifier module, with sensor/detector, shall meet the performance requirements of ISA S12.15 Part I performance standard for hydrogen sulfide gas detection instruments. The trip amplifier module shall have an interface panel, providing a mode/select switch and the following indications: 2 discrete alarm threshold level indicators, a fault or malfunction indicator, a ready indicator, a calibration mode indicator, a setup mode indicator and a 2 digit digital display. All alarm parameters and user options shall be software selectable. A power on self test (POST) shall automatically be performed each time the trip amplifier module powers. A functional card test and a front panel LED test shall be switch capable without interrupting normal on-line services.

Engineering Specification for the TA202A Trip Amplifier Module (*continued*)

The trip amplifier module shall be capable of insertion and removal during power on conditions without damage to any component module in the system. The trip amplifier module will generate display codes associated with fault conditions whenever a fault of malfunction occurs. A mode/select switch shall provide the operator front panel access to a calibration check mode, a calibration mode, a setup check mode, a setup mode and an inhibit mode. The trip amplifier module shall have a password protected setup routine capable of having the password disabled.

This chapter discusses what to do when a Model TA202A is received, the terminal connections & designations, field device location considerations and what to be aware of when applying power.

3.1 Upon Receipt of Equipment

All equipment shipped by General Monitors is packaged in shock absorbing containers which provide considerable protection against physical damage. The contents should be carefully removed and checked against the packing slip. If any damage has occurred or if there is any discrepancy in the order, notify General Monitors as soon as possible. All subsequent correspondence with General Monitors must specify the equipment part and serial numbers.

Each Model TA202A is completely checked at the factory, however, a complete check out is necessary upon initial installation and start up to ensure system integrity.

3.2 Control Module Installation

A rack or panel mounted chassis will be required when installing any Zero Two Series Module. These chassis should be mounted in non-hazardous, weather protected locations and should be subjected to minimal shock and vibrations. The rack and panel mounted chassis are available in 2, 4, 8, and 16 channel sizes. Multiple 16 channel chassis may be connected to each other to form larger systems.

In installations where two or more module types are to be mixed in the same chassis, ensure that the individual coding strips match the channel application. The coding strips are pre-configured at the factory and the male portion is already on each module. The female portion, if unmounted, must be fastened into position on the mounting strip of the desired chassis channel so as to mate with its counterpart on the module (see figure 2 below).

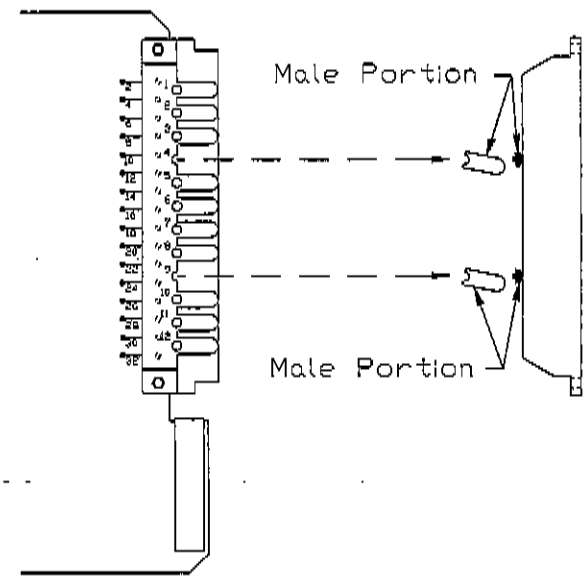


Figure 2

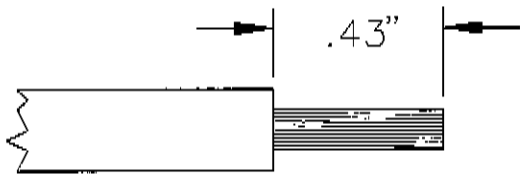
Zero Two series modules require air circulation to avoid excessive heat build-up. If chassis are stacked vertically within an enclosure, forced air circulation may be required. The Trip Amplifier Modules are, to a great extent, immune to electromagnetic interference (EMI). However, they should not be mounted in close proximity to radio transmitters or similar equipment.

3.3 Rear Terminal Connections

All wire connections to the Model TA202A are made to the terminal block located at the rear of the chassis. The terminal block accepts 16 AWG to 20 AWG, stranded or solid core wire.

Rear Terminal Connections (*continued*)

14 AWG wire may be used if it is properly stripped according to figure 3.



Strip Length

Figure 3

Contact with PC Board components should be avoided in order to prevent damage by ***static electricity***.

To connect wires to the terminal block on the Model TA202A, loosen the desired screw, insert the stripped end of the wire and tighten.

For the rear terminal designations refer to figure 4 below:

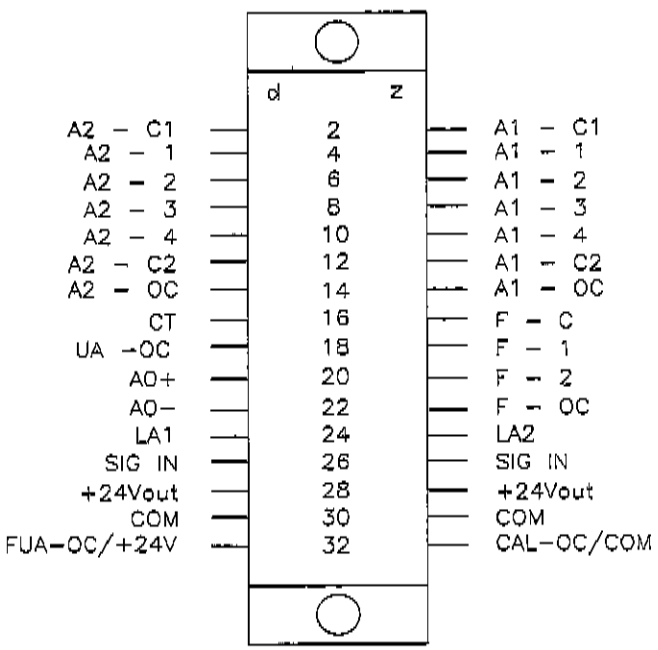


Figure 4

A2 Alarm

The terminal designations for the A2 alarm outputs are:

Label	Term	Description
A2-C1	2d	Relay Common (1 & 2)
A2-1	4d	Relay Contact
A2-2	6d	Relay Contact
A2-3	8d	Relay Contact
A2-4	10d	Relay Contact
A2-C2	12d	Relay Common (3 & 4)
A2-OC	14d	Open Collector (OC)
LA2	24z	OC Logic for **A2** LED

The A2 alarm outputs are DPDT relay contacts, one open collector output (A2-OC) that follows the logic of the relays and one open collector output (LA2) that follows the blinking pattern of the front panel LED. The A2-C1 designation is common for A2-1 & A2-2. The A2-C2 designation is common for A2-3 & A2-4. The normally open (NO) and normally closed (NC) contacts depend on a user selectable option (see chapter 5).

The table below refers to the proper open and closed A2 alarm relay contacts while the unit is on power:

User Selected Relay State	Normally Open	Normally Closed
Normally Energized	A2-C1 & A2-1, A2-C2 & A2-4	A2-C1 & A2-2, A2-C2 & A2-3
Normally De-Energized	A2-C1 & A2-2, A2-C2 & A2-3	A2-C1 & A2-1, A2-C2 & A2-4

Rear Terminal Connections (*continued*)

A1 Alarm

The terminal designations for the A1 Alarm outputs are:

Label	Term	Description
A1-C1	2z	Relay Common (1 & 2)
A1-1	4z	Relay Contact
A1-2	6z	Relay Contact
A1-3	8z	Relay Contact
A1-4	10z	Relay Contact
A1-C2	12z	Relay Common (3 & 4)
A1-OC	14z	Open Collector (OC)
LA1	24d	OC Logic for **A1** LED

The A1 Alarm outputs are DPDT relay contacts, one open collector output (A1-OC) that follows the logic of the relays and one open collector output (LA1) that follows the blinking pattern of the front panel LED. The A1-C1 designation is common for A1-1 & A1-2. The A1-C2 designation is common for A1-3 & A1-4. The normally open (NO) and normally closed (NC) contacts depend on a user selectable option (see chapter 5).

The table below refers to the proper open and closed A1 alarm relay contacts while the unit is on power:

User Selected Relay State	Normally Open	Normally Closed
Normally Energized	A1-C1 & A1-1, A1-C2 & A1-4	A1-C1 & A1-2, A1-C2 & A1-3
Normally De-Energized	A1-C1 & A1-2, A1-C2 & A1-3	A1-C1 & A1-1, A1-C2 & A1-4

Fault Alarm

The terminal designations for the Fault outputs are:

Label	Term	Description
F-C	16z	Relay Common
F-1	18z	Relay Contact (NO)
F-2	20z	Relay Contact (NC)
F-OC	22z	Open Collector (OC)
FUA	32d	Open Collector (OC)

The Fault outputs are SPDT relay contacts, one open collector output (F-OC) that follows the logic of the relays and one open collector output (FUA) dedicated to new fault indications. If the Backwards Compatible configuration is ordered, the FUA will not be present (pin 32d will be for the +24Vdc). The Fault outputs are always normally energized when power is applied to the module.

The contact ratings for the A2 & A1 alarm and Fault relays are 4A @ 250 Vac, 3A @ 30 Vdc, *Resistive, maximum.*

Inductive loads (bells, buzzers, relays, etc.) on dry relay contacts must be clamped down. Unclamped inductive loads can generate voltage spikes in excess of 1000 volts. Spikes of this magnitude may cause false alarms and contact damage. Figures 5 & 6 show recommended relay protection circuits for AC and DC loads, respectively.

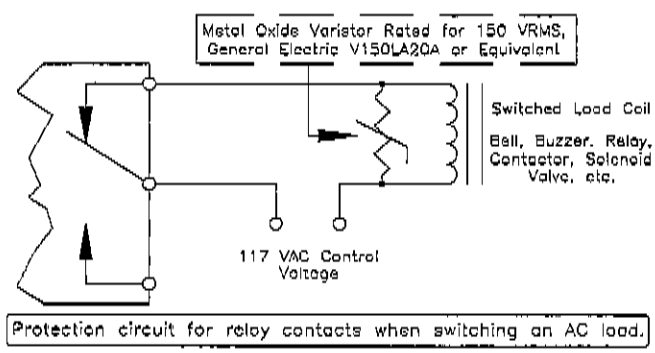


Figure 5

Rear Terminal Connections (*continued*)

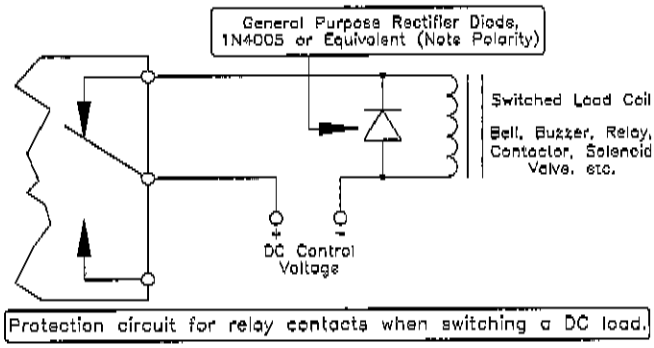


Figure 6

Unaccept

The terminal designation for the Unaccept output is:

Label	Term	Description
UA	18d	Open Collector Output

Calibration

The terminal designations for the Discrete Calibration Output is:

Label	Term	Description
CAL-OC	32z	Open Collector Output

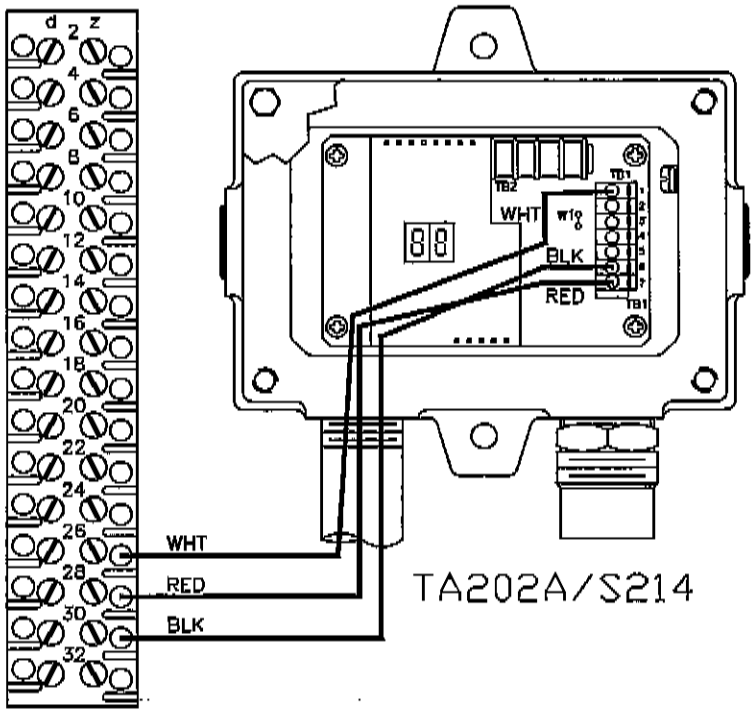
If the Backwards Compatible configuration is ordered, the CAL-OC will not be present (pin 32z will be for the COM).

Smart Sensor Connections

The terminal designations for the Field Device connections are:

Label	Term	Description
WHT	26d,z	Signal IN (Analog)
RED	28d,z	VDC Out (+24Vdc)
BLK	30d,z	DC Common

Only one Field Device may be connected to a Model TA202A.



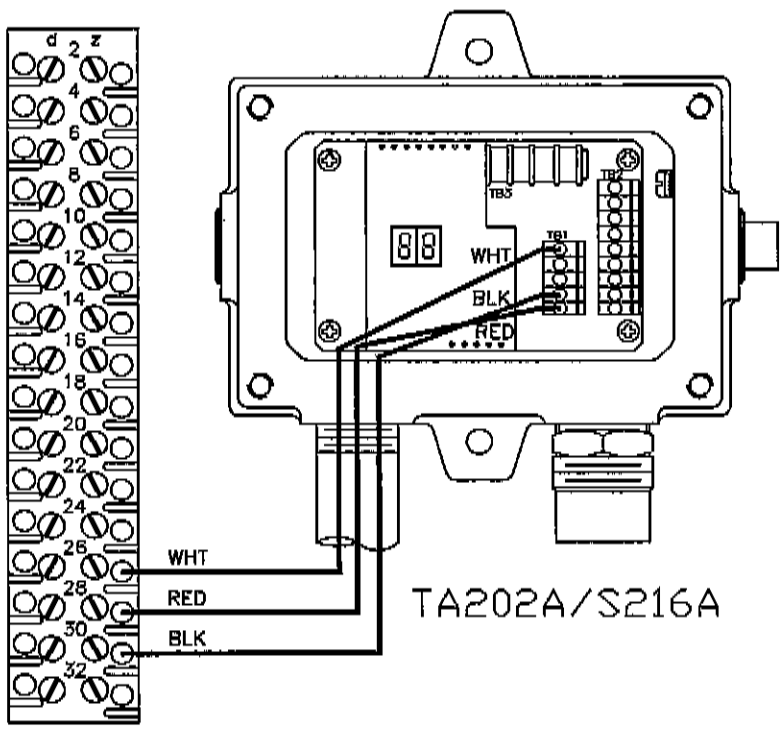


Figure 7

Figure 7 illustrates the inter-connections for the Trip Amplifier & the Field Device.

Rear Terminal Connections (*continued*)

The electrical rating for all open collector outputs is 100mA @ 35 Vdc.

Figure 8 illustrates some typical open collector external circuits.

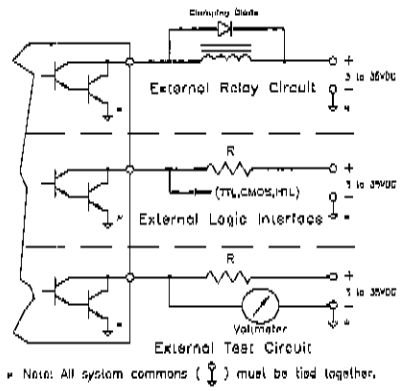


Figure 8

Card Test

The terminal designation for the Card Test Input is:

Label	Term	Description
CT	16d	Switch Connection

The Card Test Input is provided so that the user can access the Card Test feature remotely. One end of a normally open SPST switch is connected to this termination and the other end is connected to system common. To activate the feature, simply press and hold the switch for as long as the test time is to be run (runtime is 3 or 10 seconds, software selectable). Figure 9 is a block diagram that shows the switch connections for the Card Test feature.

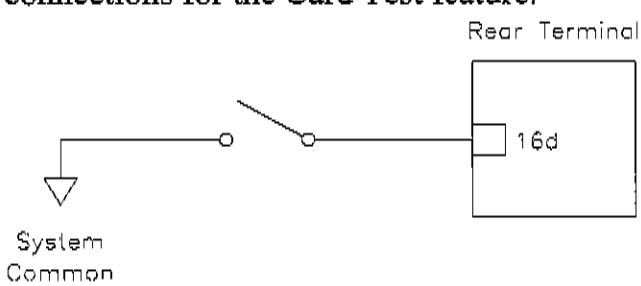


Figure 9

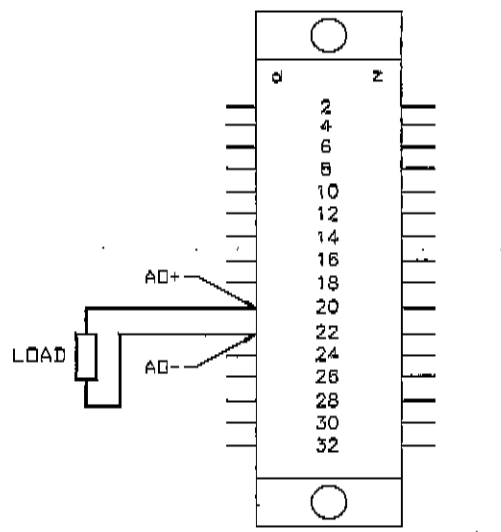
Analog Signal

The terminal designations for the Analog Output Signal are:

Label	Term	Description
AO+	20d	Analog Signal (plus)
AO-	22d	Analog Signal (minus)

If the Analog Signal is not used, a jumper must be placed between 20d & 22d.

Figure 10 is a diagram of the Analog Signal connections.



The maximum load resistance between AO+ & AO- cannot exceed 300 ohms.

Figure 10

Figure 11 indicates where the power connections for the chassis are made.

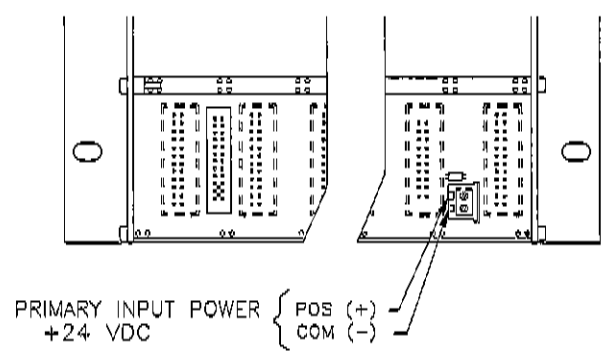


Figure 11

3.4 Sensor Location Considerations

There are no standard rules for sensor placement since the optimum sensor location is different for each application. The customer must evaluate conditions at the sensor site in order to make this determination.

Generally:

- The sensor should be easily accessible for calibration checks. Ensure that sufficient clearance exists to allow the use of field devices such as, Calibration Bottle, Portable Purge Calibrator, Splash & Dust Guards.
- The sensor head should always be pointing down to prevent water build up on the sensing element. Remember that Hydrogen Sulfide gas is heavier than air, however, do not rely too heavily on this fact when selecting a sensor position.
- The sensor should be located in areas where leaks are suspected (i.e. near valves & pipe connections, etc.).
- The sensor should not be placed where it may be coated by contaminating substances.

3.5 Sensor Poisons

Sensors may be adversely affected by prolonged exposure to certain atmospheres.

The more important poisons are:

- Glycol
- Halides . . . compounds containing Fluorine, Chlorine, Bromine and Iodine
- Heavy Metals (e.g. Tetraethyl lead)
- Sulfur

Silicones contained in greases or aerosols are the most common "coating" agents, which are not true sensor poisons, but reduce sensor response. Other damaging materials which attack the sensor physically include mineral acids and caustic vapors.

The presence of such poisons and vapors does not exclude the use of General Monitors Metal Oxide Semiconductor Sensors, however, a careful analysis of ambient conditions should be undertaken and the customer should be aware that sensor calibration may need to occur at more frequent intervals.

3.6 Applying Power

Zero Two Series Modules do not have an ON/OFF power switch. Each module in the Zero Two Series operates from 24 Vdc. Power requirements will vary according to the number and type of modules in the system, as well as the number and type of field devices.

NOTE: *If the application of power does not turn the Model TA202A ON check Fuse F1.*

This chapter discusses what general maintenance to perform, describes the electrical inputs, outputs, accepting & resetting alarm, calibration & fault conditions and fault diagnostics.

4.1 General Maintenance

Once the Model TA202A has been installed, very little maintenance is required other than periodic checks to verify the integrity of the system.

- The user should evaluate conditions at the sensor site to determine how frequent calibration checks should be performed.
- A functional test of the system should be performed at least once each year. This test should include full operation of stand-by systems or back up power for the prescribed period.
- The power, sensor and output wiring should be checked for tightness, verifying that all of the components and devices are connected correctly. Verify that the fuses (F1, F2 & F3) are good.
- If the "Password" is disabled, periodic checks of the setup parameters should be performed.

4.2 Electrical Inputs

There are two electrical inputs to the Model TA202A. They are the General Monitors' Field Device and the Card Test input. Both of these input connections (field device and card test) are made to the rear terminal block (see chapter 3 for more detailed installation information).

- The Smart Sensor input consists of the standard three lead connections used with General Monitors' Field Devices (Black = Common, White = Signal, Red = +24Vdc). See figure 7 on page 10 of this manual.
- The Card Test input consists of a single termination for remote testing of the Model TA202A's functions. For detailed information on the Card Test, refer to figure 9 on page 11 of this manual.

4.3 Electrical Outputs

The electrical outputs on the Model TA202A consist of relay contacts, open collectors and an analog current signal.

- The following outputs have rear terminal relay contacts:

  A1 Alarm - DPDT relay contacts

  A2 Alarm - DPDT relay contacts

  Fault - SPDT relay contacts

All of the relay contacts on the Model TA202A have a maximum rating of:

4A @ 250Vac, 3A @ 30Vdc resistive

- The following outputs have rear terminal open collectors:

  A1 Alarm & LED Mimic

  A2 Alarm & LED Mimic

  Fault

  UA - Unaccepted Alarm

  FUA - Unaccepted Fault

  CAL - Calib. & Calib. Check Modes

All of the open collector outputs on the Model TA202A have a maximum rating of:

100mA @ 35Vdc

Electrical Outputs (*continued*)

- The Analog Output Signal is used for sending gas concentrations and status information to remote devices. The maximum analog load may not exceed 300 ohms from the Field Device to the Trip Amplifier to any other remote device and back to the Field Device, including the wire/cable. The rear termination labeled "Signal IN" is part of the overall analog loop. The analog signal is generated by the field device and passes through the Model TA202A. This signal is a 0 to 21.7mA current signal with 4 to 20mA being proportional to 0 to 100% of full scale. When the field device is placed in the calibration or calibration check mode a 1.5mA signal (0mA is optional for the field device) is generated by this output. During the calibration or calibration check mode the display on the TA202A will indicate **CA** if the CAL current is 1.5mA. If the CAL current is 0mA the TA202A display will indicate **F4** (field device error).

  When the Model TA202A enters into a fault condition the Analog Output Signal is pulled down to 0mA. During a fault the display will indicate a fault code ("**F**" followed by a digit). *Verify fuses F2 & F3.*

  If the sensor attached to the Model TA202A is seeing gas in excess of 100% of full scale, this output will generate a signal between 20 and 21.7mA (not proportional). An over range condition is indicated by a flashing digital display reading full scale (**99**, **50** or **20**).

4.4 Accepting Alarm Conditions

Whenever a new alarm condition occurs the front panel LED and open collector associated with that alarm (LA1 or LA2) will flash. In addition, the associated alarm outputs and the unaccept outputs (TA202A, UA open collector & FM002A, UA relay) will activate, unless they are already activated. The flashing front panel alarm LED and rear terminal open collector indicate that a new alarm has been activated. New alarms should be acknowledged or accepted. This is accomplished with the Master Accept Button located on the Facilities Module. Pressing the Master Accept Button de-activates the UA outputs and causes the associated front panel alarm LED and rear terminal open collector to stop flashing and energize.

NOTE: Alarms that latch must be Accepted before they can be Reset (see 4.5 of this chapter).

There is a unique situation that may occur with some frequency in certain applications. An alarm may occur and the operator will accept this alarm by pressing the Master Accept Button. If the alarm output is latching and the condition at the sensor returns to normal (safe) the alarm output will need to be reset. If, however, the alarm output is accepted but not reset and that alarm set point is exceeded again, the front panel LED, the associated mimic open collector and the unaccept outputs will reflash or re-activate. This gives the operator an indication of a new alarm condition that must be re-accepted.

A type of alarm, other than the A1 & A2 alarms, is the fault alarm. The fault alarm can be accepted similarly with the A1 & A2 alarms. The front panel fault LED will flash and the fault unaccept (FUA) open collector will energize when a fault is detected. If the operator presses the accept button, the FUA output will de-energize and the Fault LED will stop flashing, but stay illuminated until the fault condition is corrected.

4.5 Resetting Latched Alarms

The user may select a "latching" or "non-latching" alarm output for A1 and/or A2. If an alarm output activates and the condition that caused that activation is no longer present, a non-latching alarm output will reset automatically, whereas a latched alarm output will need to be reset manually. Resetting latched alarm outputs is accomplished with the Master Reset Button located on the Facilities Module (FM002A). Pressing the Master Reset Button will reset any latched conditions that are no longer valid.

NOTE: Latched alarm conditions cannot be Reset until they have been Accepted (see section 4.4 of this chapter).

The Master Reset Button performs another function. If the operator presses and holds the Master Reset Button for two or more seconds, all of the LEDs and LED segments in the digital display will illuminate for as long as the operator presses the button. This is called the LED Test. The LED test cannot be performed while the unit is in alarm or fault or during a Card Test.

4.6 CAL Open Collector

There is an open collector that will energize anytime the Field Device is placed in the Calibration Mode or the Calibration Check Mode. This open collector output is referenced to the system's ground/common. Energizing this output merely provides a path to ground as is the case with all energized open collector outputs. De-energized, this output will be in a high impedance state.

4.7 Card Test Feature

The Card Test Input is provided so that the user can access the Card Test feature remotely. One end of a normally open SPST switch is connected to this termination and the other end is connected to system common (see figure 9 on page 11).

To activate the Card Test feature, simply press and hold the switch for at least three seconds. The front panel LEDs and digital display will begin ramping up at the start of the card test and will continue to ramp up for the software selectable ramp time specified by the operator (3 or 10 seconds) during the Setup Mode (see section 5.4). Each alarm level (A1 & A2) will trip when the alarm setpoint is exceeded. The analog output signal will ramp from 4 to 20mA during the test. At the conclusion of the Card Test, the A1 & A2 outputs will automatically reset (overriding any latching option). A Card Test cannot be initiated if the unit is in alarm or fault or during an LED Test.

NOTE: The relays (A1 & A2) and open collector outputs are active and will trip during the Card Test, unless the user specified option disabling these outputs is selected during the Setup Mode. This should be treated as a functional test of a Zero Two System.

4.8 Calibration & Calibration Check Modes

In order to ensure the integrity of life protecting equipment General Monitors' recommends that field devices have periodic calibration checks to determine if a calibration is necessary.

Calibration & Calibration Check Modes (*continued*)

General Monitors' Hydrogen Sulfide Gas Smart Sensors include a Calibration Check (Test Gas Mode) mode with a standard 1.5mA or an optional 0.0mA calibration output signal.

During this "Calibration Check" mode, the Smart Sensor will output a 1.5mA or a 0.0mA signal to the TA202A. The 1.5mA signal is the standard Calibration and Calibration Check output signal and will cause the **CAL** LED to illuminate and the display to indicate **CA** on the Model TA202A. When the Model TA202A receives a 1.5mA signal from the field device, the CAL-OC output and the CALBUSS are activated also. The 0.0mA signal is an optional Calibration and Calibration check output signal that activates the Fault outputs, causes the **FAULT** LED to illuminate and displays **F4** on the Model TA202A.

These Smart Sensors may require periodic calibration. Refer to the specific instruction manual for detail information on calibrating the field device (*S214 & S216A*).

4.9 Fault Diagnostics

In addition to the Fault LED on the front panel, the Model TA202A provides a fault code on the digital display whenever a fault condition occurs. If the unit is not ON, check fuse F1. The Fault Codes that can appear on the digital display are summarized below and in the next column.

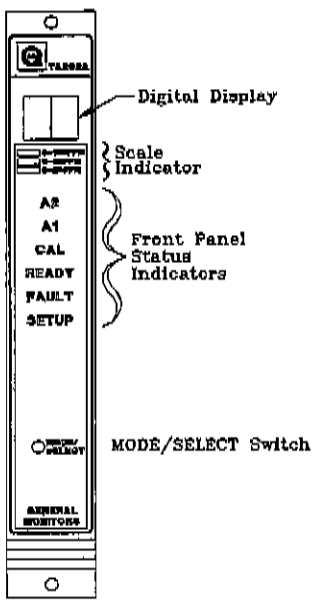
- **F1**, **F2**, **F5** & **F9** - Are not used at this time. These codes have been reserved for future use.
- **F3** - Program checksum error. This fault occurs during initial power-up of the unit. If this fault occurs, remove and reapply power to the unit. If the fault continues to occur, replace the unit and consult your GMI Representative or the factory.
- **F4** - Field device error. Make sure the wires running to and from the Trip Amplifier and the Field Device are connected properly. Check for opens and shorts across the field wiring. Make sure the analog signal is returned to the field device or common (jumper AO+ & AO- if unused). Possibly an optional 0mA Calibration Current from the Smart Sensor. *Check fuses F2 & F3.*
- **F6** - Low supply voltage. Make sure the supply voltage level at the chassis is 24Vdc.
- **F7** - EEPROM verification failure. This fault will occur if the microprocessor can not store calibration or setup information in the EEPROM. If this fault occurs consult the factory or your GMI Representative.
- **F8** - Failed to complete setup. This fault may occur during or immediately after the Setup Mode. If this fault occurs consult the factory or your GMI Representative.

In each of the fault cases listed on this page, when the fault occurs the FUA output is activated. Pressing the **ACCEPT** button on the Facilities Module (FM002A) will acknowledge the fault, de-activate the FUA output and the fault LED will stop flashing and remain **ON** until the fault is corrected.

This chapter discusses the user interfaces, the Setup Check & Setup Modes and the Inhibit Mode.

5.1 Types of User Interfaces

User interfaces are provided so that the operator may interpret and direct the Model TA202A in the performance of its various functions. User interfaces (figure 12) consist of a digital display, status indicators and a Mode/Select switch.



The digital display provides the user with the gas concentration at the sensor site, fault diagnostic codes and setup parameters. The status indicators provide the user with an indication of the current mode of operation (alarm, fault, ready, calibration and setup). The Mode/Select switch provides the user access to the Setup Check, Setup and Inhibit modes.

Figure 12

5.2 Setup Check & Setup Modes

The Setup Check Mode allows the operator to view the selected options for the module without allowing any changes to be made. Once this mode has been entered, the module will automatically display each of the selected options for a short period of time. The Setup Mode allows the operator to change the operating parameters by making choices for selected options.

The Setup Check and Setup Modes display identical information with the following exceptions:

- The Setup Check Mode allows the user to view the operating parameters of the Model TA202A, whereas the Setup Mode allows the user to change these parameters.
- Entering the optional Password is only available in the Setup Mode.
- The Inhibit Mode may only be entered from the Setup Mode. If the Inhibit Mode is entered, the unit will remain in the Inhibit Mode until the Mode/Select switch is pressed.
- After the Setup Mode is complete the TA202A will execute the Setup Check Mode to view the selected parameters.

NOTE: *The Setup and Setup Check Modes cannot be entered if the unit is in alarm or fault. If the field device is in calibration, calibration check or test gas mode the Setup and Setup Check Mode cannot be entered.*

During the Setup Mode the operator will be allowed to select options. The selection procedure is the same for most of the options. Pressing the Mode/Select Switch toggles the available choices. When the display has indicated a choice for five consecutive seconds, without the operator pressing the Mode Select Switch, the Setup routine will accept that selection and move on to the next option available. These modes will activate the CAL LED, the CAL-OC output and the CALBUSS.

NOTE : *Before entering the Setup Mode to make changes, the user should become familiar with the block diagram on page 18 and fill out the form listed there. This will aid the user during the selection process in the Setup Mode.*

Setup Check & Setup Modes (*continued*)

This section is provided to aid the operator in making selections during the Setup Mode. It is recommended that the operator fill in the selections in the proper blanks and then use this page as a reference while programming the TA202A. The blocks shown below indicate the order of options in the Setup Mode. To the right of each block is a description of the choice(s) that are available. More information about making each selection is provided in the pages that follow.

		ENTER SELECTION
Password	Enter the Password, if the Password is enabled.	
Inhibit Mode ?	Enter the Inhibit Mode, if desired.	
Set Display Range	Display will indicate "Sr" until the sensor range is selected 0 to 100ppm, 0 to 50ppm or 0 to 20ppm	_____
A2 Alarm Options	Set the Energized (En) / De-Energized (dE) Option Set the Latching (LA) / Non-Latching (nL) Option Set the A2 alarm set point (A1 setpoint to 95 for 0-100 PPM, A1 setpoint to 50 for 0-50 PPM and A1 setpoint to 20 for 0-20 PPM)	_____ _____ _____
A1 Alarm Options	Set the Energized (En) / De-Energized (dE) Option Set the Latching (LA) / Non-Latching (nL) Option Set the A1 alarm set point (from 10 to A2 set point for 0-100 PPM, 5 to A2 setpoint for 0-50 PPM and 2 to A2 setpoint for 0-20 PPM)	_____ _____ _____
Fault/Inhibit Option	Set the Fault Activate (Ac) or not (nA) during Inhibit Mode	_____
Card Test Options	Display will indicate "ct" for 5 seconds Set the ramp time for the Card Test Mode (3 or 10 seconds) Set the Alarm outputs for Active (Ac) or Not Active (nA)	 _____ _____
Password Options	Set the Password to be Disabled (Pd) or Enabled (PE) If the Password is Enabled: Set the password digits . . . . Left _____ Right_____	_____
Setup Check Mode	After all of the options have been selected, the TA202A will enter the Setup Check Mode.	

Setup Check & Setup Modes (*continued*)

NOTE: The Password, the A1 & A2 Alarm set points and the calibration level options offer the operator more than two choices. While these options are being selected, pressing the Mode/Select Switch will sequence the display to the next available choice for that option.

ENTERING THE SETUP MODE

To Enter the Setup Check Mode or the Setup Mode, press and hold the Mode/Select switch until the **SETUP** LED begins flashing (about ten seconds). When the **SETUP** LED is flashing, release the Mode/Select switch to enter the Setup Check Mode (figure 13). Continuing to press and hold the Mode/Select switch until the **SETUP** LED stops flashing (about fifteen seconds) will allow the operator to enter the Setup Mode. When the **SETUP** LED stops flashing and stays on, release the Mode/Select switch and the unit will enter the Setup Mode (figure 13).

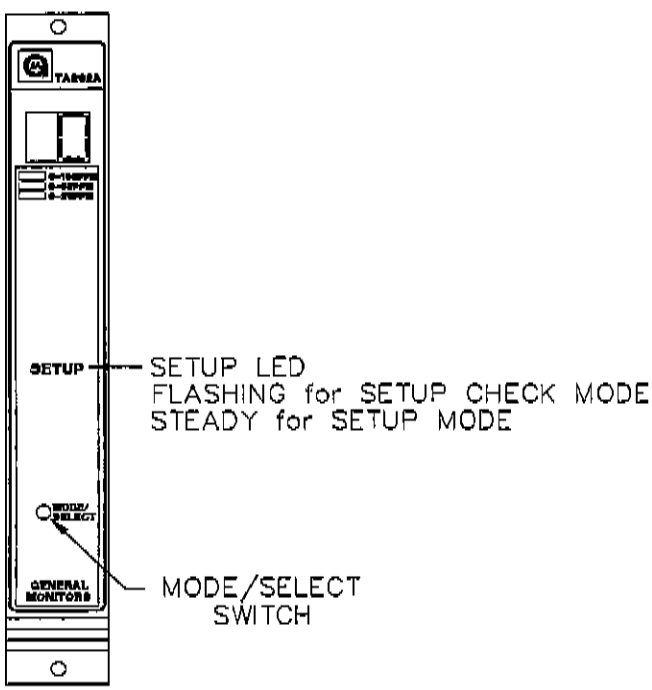


Figure 13

ENTERING THE PASSWORD

- **This option applies to the Setup Mode only:** If the password option is enabled, the right digit of the display will be blank and a **0** will appear in the left digit on the display (figure 14). If the number is incorrect, press the Mode/Select switch until the correct number is displayed, then wait about five seconds.

The left digit of the display will be blank and a **0** will appear in the right digit on the display (figure 14). If the number is incorrect, press the Mode/Select switch until the correct number is displayed, then wait about five seconds. If the password is correct the user will proceed with the inhibit option. If the password is incorrect the user will not be able to proceed and unit will return to the normal operating mode. Once in the operating mode the user may attempt to re-enter the Setup Mode. The factory default password is **00**.

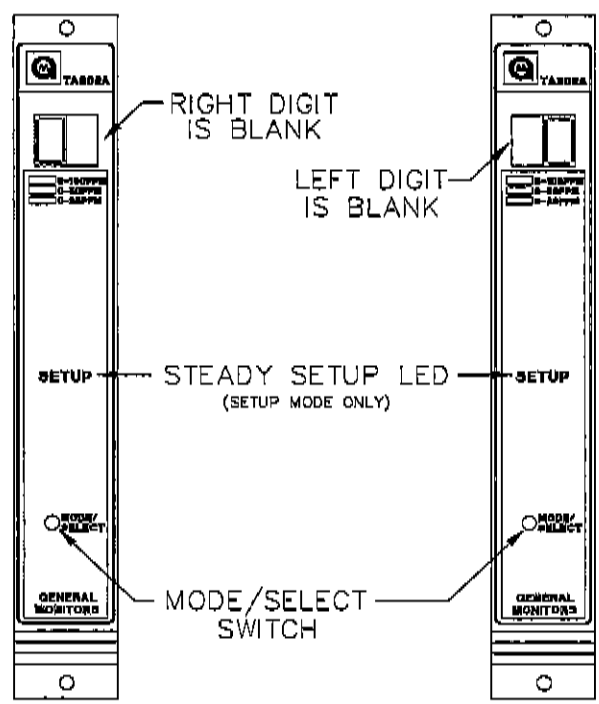


Figure 14

Setup Check & Setup Modes (*continued*)

ENTERING THE INHIBIT MODE

- This option applies to the Setup Mode only: If the password option is disabled, or after the correct password has been entered, the display will indicate **In** for five seconds (figure 15). Pressing the Mode/Select switch while **In** is displayed, will cause the unit to enter the Inhibit mode by inhibiting the alarm outputs. After the Model TA202A has entered the Inhibit mode, pressing the Mode/Select switch causes the unit to return to normal operation (see section 5.3). If it is desired to enter the Setup Mode, do not press the Mode/Select switch for the five seconds that **In** is displayed.

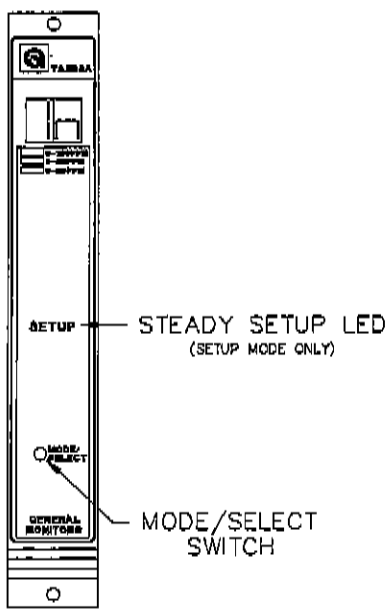


Figure 15

SENSOR RANGE OPTION

- Next, the user will select the Sensor Range for the display (figure 16). The display will indicate **Sr**, and the 0-20PPM, 0-50PPM or 0-100PPM LED will be illuminated. Press the Mode/Select Switch until the desired Sensor Range LED is illuminated. The factory default for this selection is 0-100PPM.

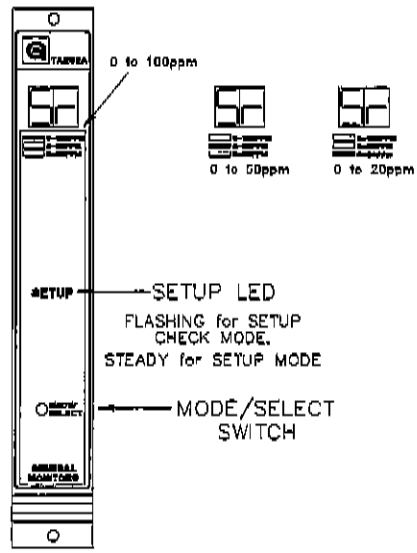


Figure 16

If the sensor range is changed the alarm set points (A1 & A2) will automatically be scaled proportionally to reflect the new Sensor Range.

A2 ALARM OPTIONS

- After the Sensor Range option has been selected, the **A2** LED on the front panel will be flashing while the Energized/De-Energized option is displayed (figure 16). The display will indicate the current selection, (**En** or **dE**). De-Energized is the factory default for this selection.

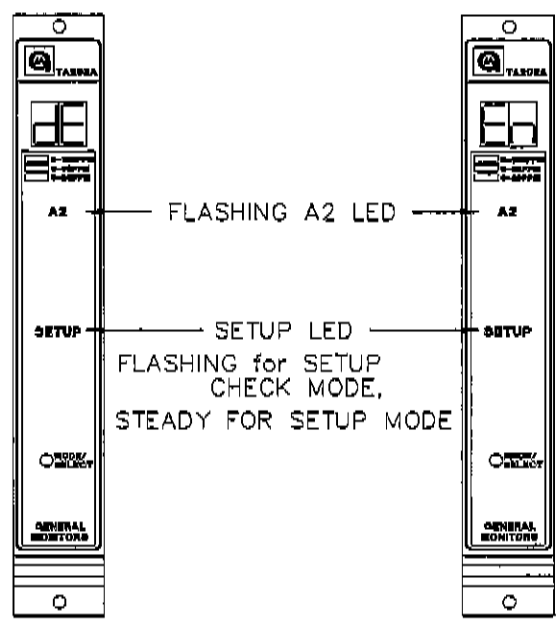


Figure 17

Setup Check & Setup Modes (*continued*)

- The **A2** LED on the front panel will be flashing while the latching/non-latching option is displayed (figure 18). The display will indicate the current selection, (**nL** or **LA**). Latching is the factory default for this selection.

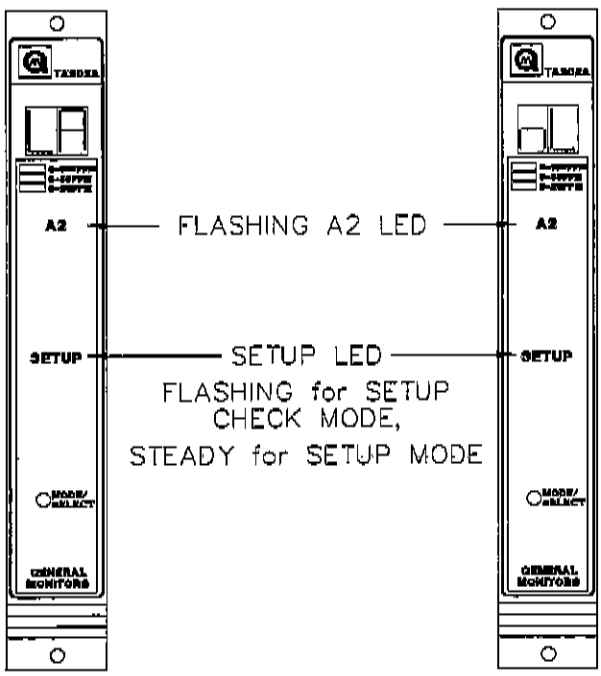


Figure 18

- The last A2 alarm option to appear on the display will be the alarm set point (trip level). The A2 set point cannot be set lower than the current A1 set point. To accomplish this the operator must set the A1 set point lower than the desired A2 set point, then re-enter the Setup Mode and select the desired A2 set point.

  If the set point is reached or exceeded the A2 alarm outputs will activate. The display will indicate the current A2 alarm set point (figure 19). Press the Mode/Select switch repeatedly, until the desired A2 alarm set point appears on the display. **60** is the factory default for this selection.

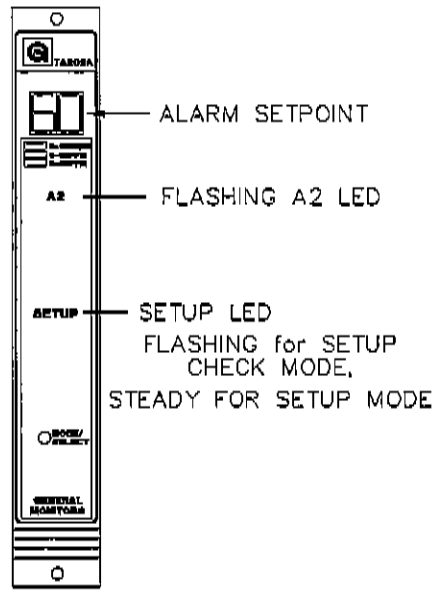


Figure 19

A1 ALARM OPTIONS

- Next, the **A1** LED on the front panel will be flashing while the Energized/De-energized option is displayed (figure 20).

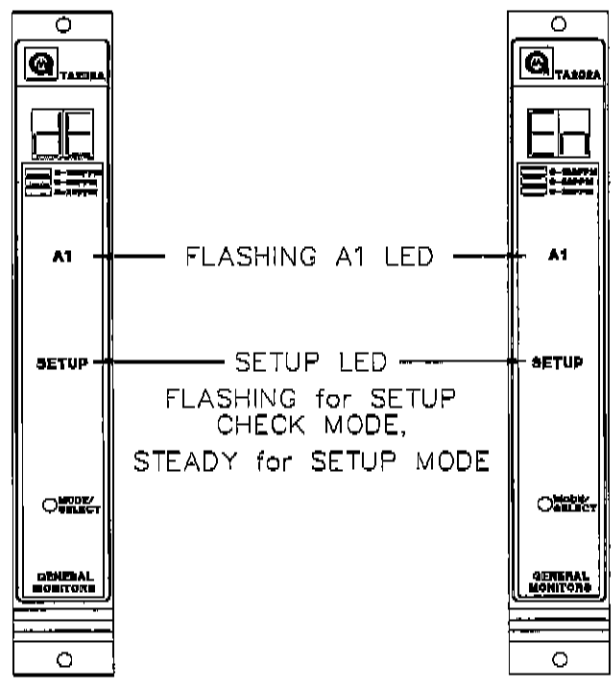


Figure 20

The display will indicate the current selection, (**En** or **dE**). De-Energized is the factory default for this selection.

Setup Check & Setup Modes (*continued*)

- The **A1** LED on the front panel will be flashing while the latching/non-latching option is displayed (figure 21). The display will indicate the current selection, (**nL** or **LA**). Non-Latching is the factory default for this selection.

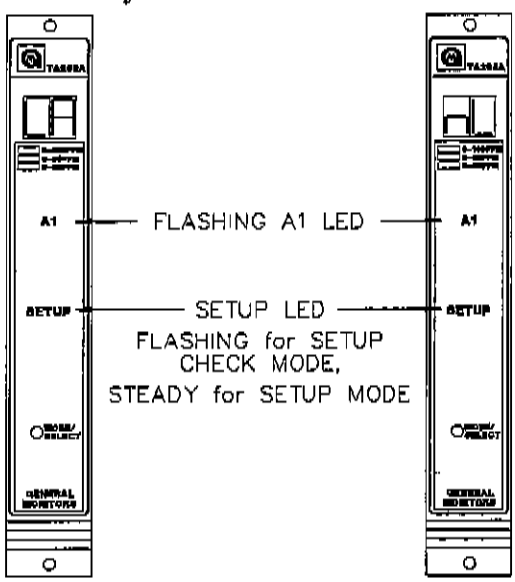


Figure 21

- The last A1 alarm option to appear on the display will be the alarm set point (trip level). The A1 set point cannot be set higher than the current A2 set point. If this level is reached or exceeded the A1 alarm outputs will activate. The display will indicate the current A1 alarm set point (figure 22). Press the Mode/Select switch repeatedly, until the desired A1 alarm set point appears on the display. **30** is the factory default for this selection.

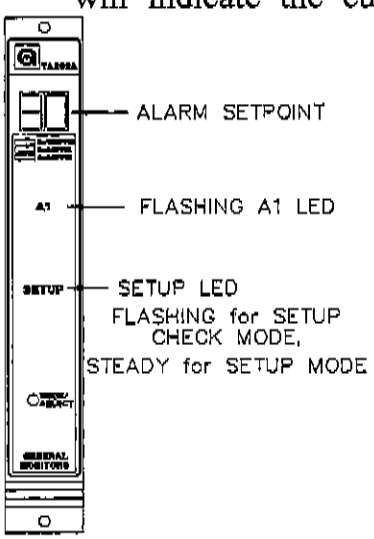


Figure 22

FAULT / INHIBIT OPTION

- After the A1 alarm options have been selected, the user will select the Fault/Inhibit option. The **FAULT** LED on the front panel will be flashing while the display indicates **Ac** or **nA** (figure 23). An **Ac** selection specifies that the Model TA202A will activate the Fault circuit while the unit is in the Inhibit Mode. An **nA** selection specifies that the Model TA202A will not activate its Fault circuit when the unit is placed in the Inhibit Mode (see section 5.3). An **nA** selection will not disable the Fault circuit, therefore, if a Fault occurs during the Inhibit Mode, the unit will activate the Fault circuit. Not Active is the factory default for this selection.

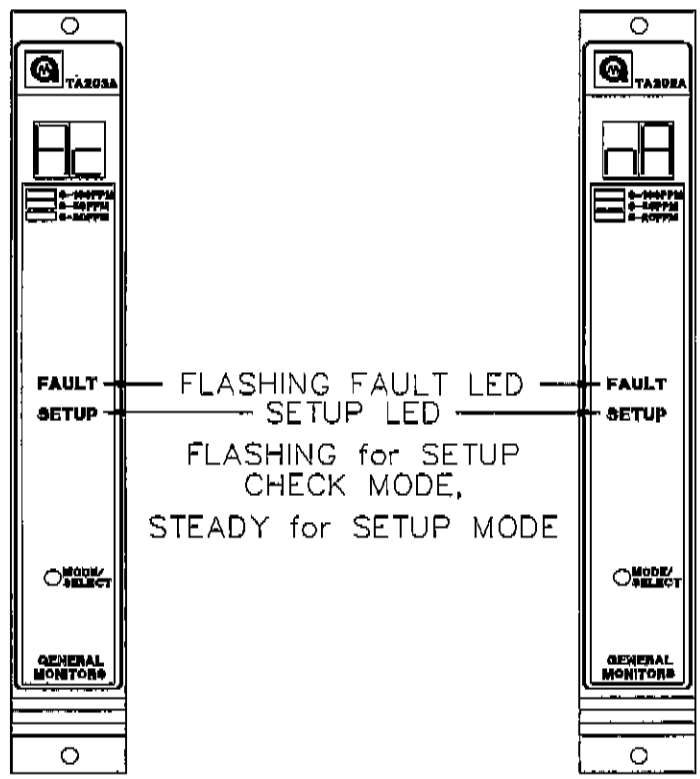


Figure 23

Setup Check & Setup Modes (*continued*)

CARD TEST OPTIONS

- After the Fault/Inhibit option has been selected, the user will select the ramp time (3 or 10 seconds) and whether or not the alarm outputs will activate during a Card Test. The display will indicate **ct** for about five seconds (figure 24).

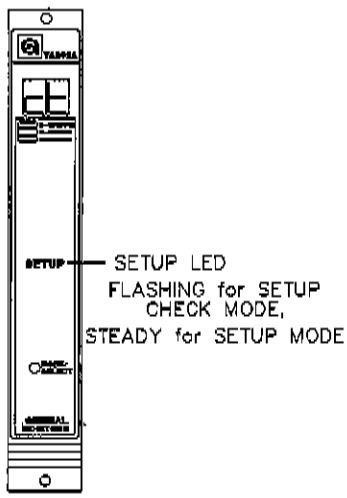


Figure 24

- Following **ct**, the ramp up time (**3** or **10**) during the card test (figure 25) will be displayed. **3** is the factory default for this selection.

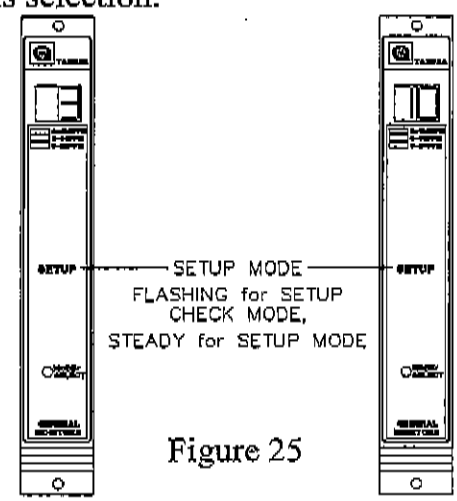


Figure 25

- Next, the display will indicate the alarm output option during a Card Test as either **Ac**, active or **nA**, not active. (figure 26). Not Active is the factory default for this selection.

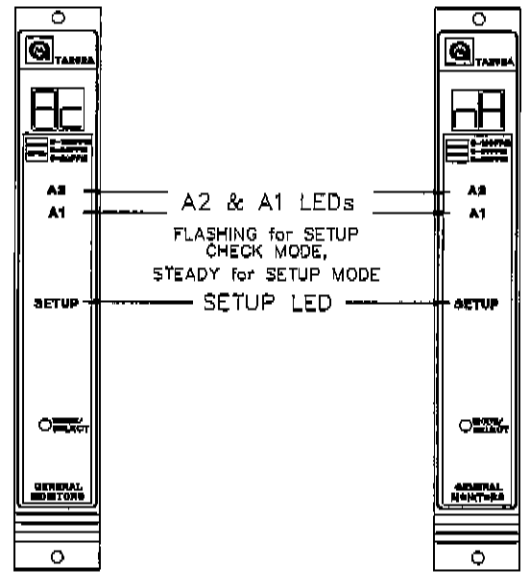


Figure 26

NOTE: *Selecting* **nA** *option for the Card Test will not inhibit the Fault or A1/A2 alarm circuits in the event of a malfunction or gas condition, during normal operation.*

PASSWORD OPTION

- Once the Card Test options have been selected, the user will either enable or disable the password option (figure 27). The display will indicate either **PE**, for enabled or **Pd**, for disabled. Password Disabled is the factory default for this selection.

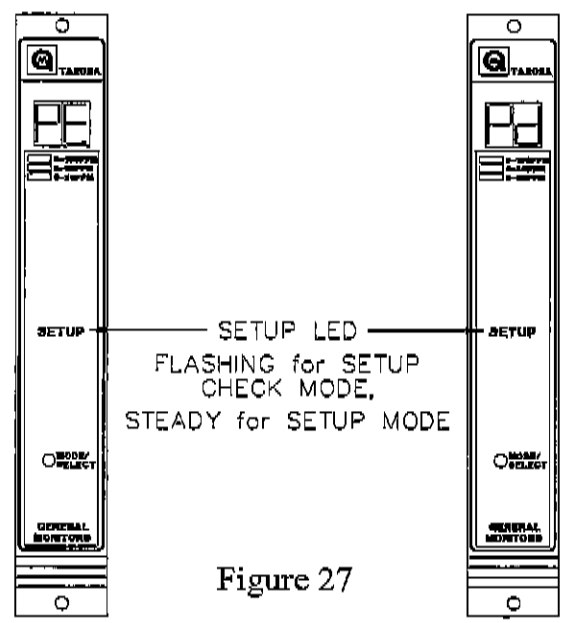


Figure 27

Setup Check & Setup Modes (*continued*)

ENTERING A NEW PASSWORD

This option applies to the Setup Mode only: If the Password is disabled, the unit will automatically enter the Setup Check mode. If the Password is enabled, the user will be able to enter a new password (refer to the NOTE on page 19). The unit will display the left digit of the Password on the display. The right digit will be blank until the left digit has been selected. Once the left digit is selected, wait for five seconds. Next, the right digit will be displayed and the left digit will be blank until the right digit has been selected. Once the right digit has been selected, wait for five seconds (figure 28).

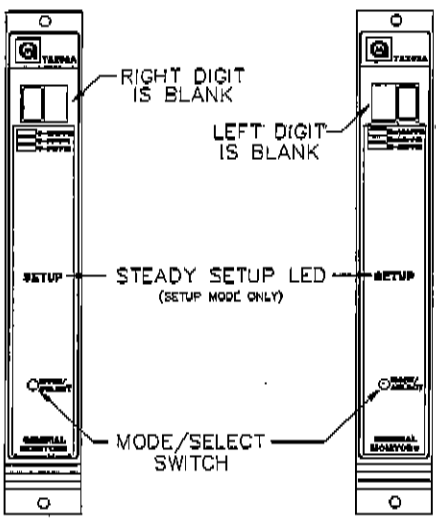


Figure 28

When the Setup Mode is complete, the Model TA202A will automatically enter the Setup Check Mode. This allows the operator to view the newly selected options. The unit will return to normal operation after completing the Setup Mode and the Setup Check Mode.

5.3 Inhibit Mode Description

Whenever the Inhibit Mode is entered (see section 5.2), the A1 and A2 rear terminal alarm outputs are inhibited. The front panel A1 and A2 LEDs will still function normally, in cases where sufficient hydrogen sulfide gas is present. If the password option is disabled, or after the correct password has been entered, the display will indicate **In** for five seconds (figure 15 on page 19). Pressing the Mode/Select switch while **In** is displayed, will cause the unit to enter the Inhibit mode by inhibiting the alarm outputs. After the Model TA202A has entered the Inhibit mode, pressing the Mode/Select switch causes the unit to return to normal operation. If it is desired to enter the Setup Mode, do not press the Mode/Select switch for the five seconds that **In** is displayed.

NOTE: *Any latched alarms must be reset before exiting the Inhibit Mode.*

There is a user selectable option that will place the unit in Fault every time the Inhibit Mode is entered. If the operator does not select this option the Fault circuits will function normally during the Inhibit Mode (i.e. they will not be inhibited).

While the unit is in the Inhibit mode, the display will indicate **In** for 5 seconds, then the Gas Concentration will be displayed for 5 seconds. This sequence will repeat for as long as the unit is in the Inhibit mode.

The Inhibit Mode is provided so that the operation of Model TA202A can be verified without tripping external devices that are connected to the A1 and A2 outputs. This type of verification usually occurs during "Initial Start-Up" and/or "Commissioning".

NOTE: *The Calibration and Calibration Check Modes are accessed at the field device. Refer to the Instruction Manual of the specific field device for entering and using the Calibration and Calibration Check Modes. (also see the Sensor Assembly/Accessories Section of this Manual) The Calibration Check Mode is sometimes refered to as the Test Gas Mode.*

This chapter provides a description of the types of field devices (Smart Sensors), and the accessories, that can be used with these field devices.

6.1 Smart Sensors

Generally speaking, General Monitors' field devices, for the Model TA202A, consist of Smart Sensors for hydrogen sulfide gas applications. There are different types of General Monitors' Smart Sensors.

The Model S204 (figure 29) was designed to replace the ST200 and features enhanced electronics, housing improvements, a digital display and greater fault diagnostics, as well as the standard 4 to 20mA output, microprocessor based electronics and automated calibration. A sister model, the S206 (figure 29), has all of the features of the S204 plus an on board SPDT alarm relay.

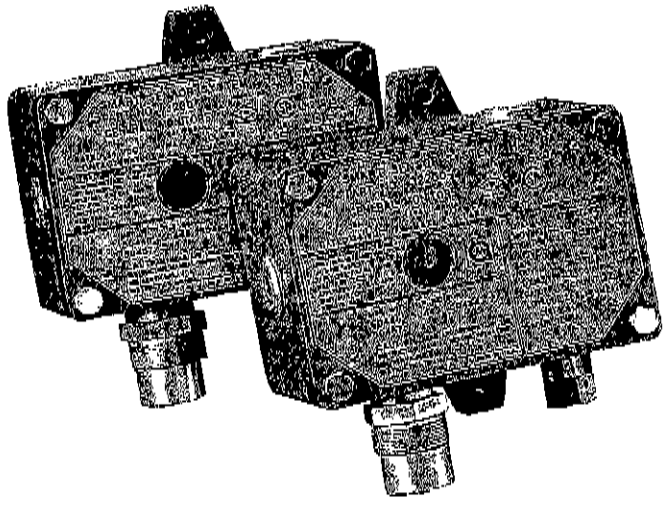


Figure 29

The Model S214 (figure 30) was designed to replace the S204 (figure 29) and the Model S216A (figure 30) was designed to replace the Model S206 (figure 29).

The Model S214 features housing improvements and single point, automated calibration with no tools or adjustments, as well as the standard 4 to 20mA output and microprocessor based electronics. The Model S216A features these improvements and has 3 on board SPDT relays (2 alarm, 1 fault). *(CSA & FM approved)*

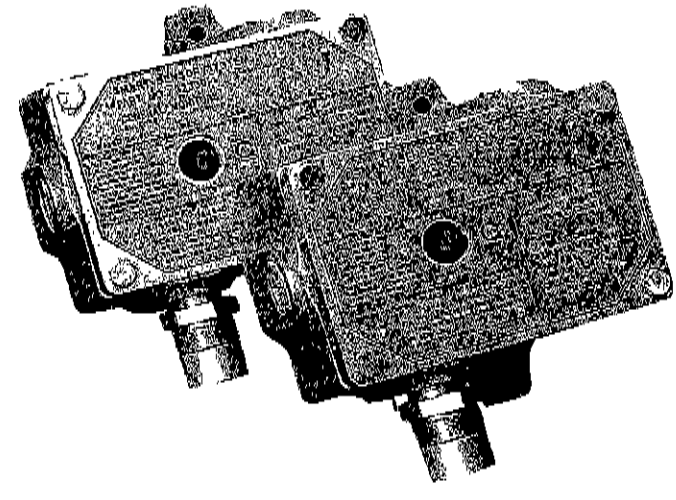


Figure 30

Smart Sensors (*continued*)

The detection elements for General Monitors Smart Sensors includes a variety of Solid State MOS Sensors with different detection ranges, sensor bodies and flame arrestors:

50445	Aluminum Body, Wire Screen Flame Arrestor
50448	Stainless Steel Body, Wire Screen Flame Arrestor
50454	Aluminum Body, Sintered Flame Arrestor
50457	Stainless Steel Body, Sintered Flame Arrestor

Each sensor listed above is available in 3 different detection ranges. Adding a "-1" suffix to the number makes that sensor a 0 to 100ppm range sensor. Adding a "-5" suffix or a "-9" suffix will make the sensor a 0 to 50ppm or 0 to 20ppm range sensor, respectively. Example: a 50457-9 is a Stainless Steel Body Sensor with a Sintered Flame Arrestor and a 0 to 20ppm range.

The block diagram in figure 31 illustrates the Smart Sensor's control electronics.

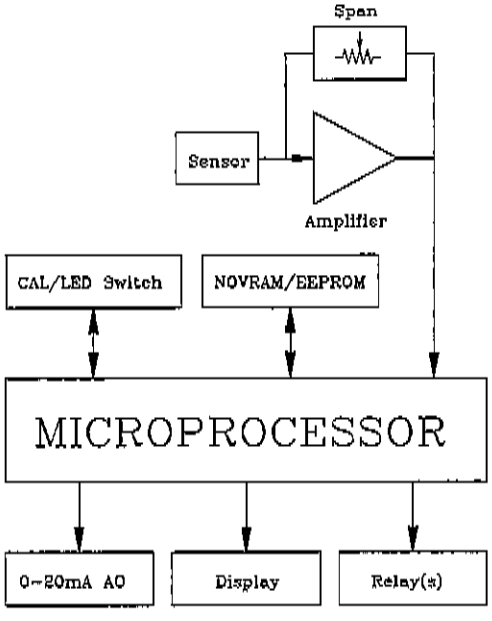


Figure 31

The Model S216A is the only Smart sensor that has relays, otherwise the functions shown in figure 31 are identical for each hydrogen sulfide gas smart sensor.

6.2 Splash Guard

General Monitors produces a universal Splash Guard, P/N 10395-1, that has been designed for use on all General Monitors combustible gas and hydrogen sulfide gas sensors (figure 32).

The Splash Guard prevents water from rain or equipment wash downs from being forced into the sensor cavity and affecting the response of the sensing element. Constructed of rugged Valox plastic, it has a series of internal baffles to deflect water down and away from the sensor.

This guard is also threaded for simple screw on installation. The splash guard is recommended for outside applications where rain or frequent hose downs occur, such as offshore platforms. Sensor response may be affected by this splash guard.

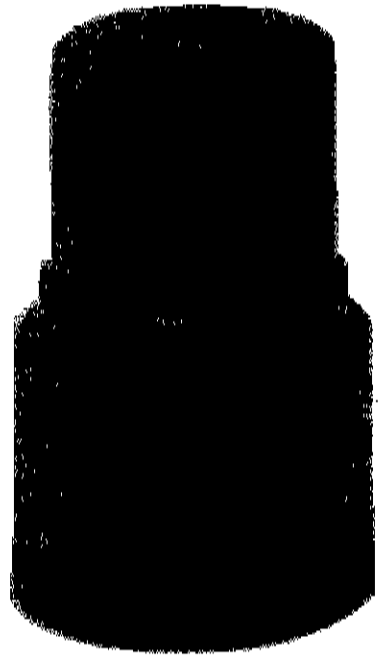


Figure 32

6.3 Dust Guard Assembly

The Dust Guard Assembly (figure 33) is a simple, threaded stainless steel cylinder with a wire screen at one end. It is easily removed for cleaning and/or replacement of the disposable screen. This General Monitors accessory is specifically designed to prevent dust and particulate matter from reaching the sensor flame arrestor. Such debris can plug the screen and limit the amount of gas reaching the active surface of the sensor. When the dust guard is installed, this problem is eliminated and sensor response is unchanged.

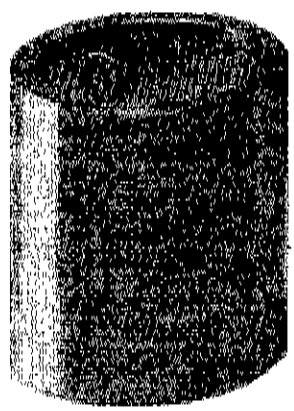


Figure 33

The Dust Guard is also available in a kit with twelve replaceable screens (figure 34). It can also be used as an effective wind screen, and is recommended for corrosive, windy or high temperature environments.

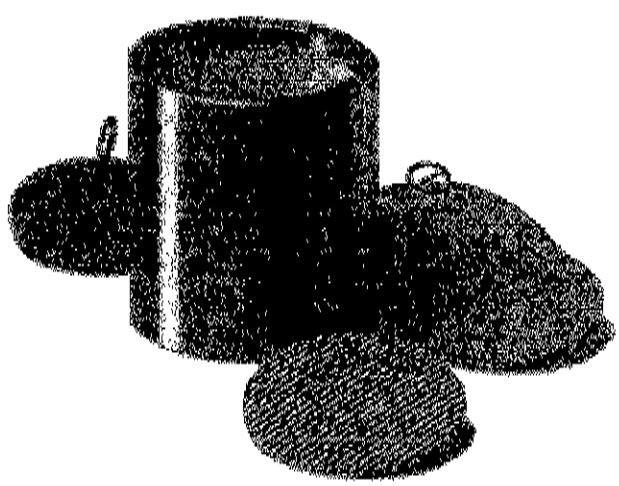


Figure 34

6.4 Duct Mounting Plates

General Monitors produces a Duct Mounting Plate (P/N 10041) for applications that require the sensor to be mounted in an air-conditioning or heating duct. The Duct Mounting Plate is easy to install (figure 35).

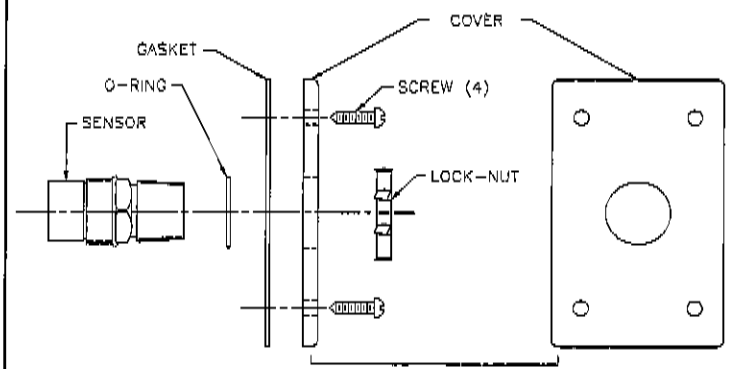


Figure 35

Read and understand the bulleted list below before mounting the Sensor into a duct.

- Select a location on the duct and cut out a hole large enough for the Sensor to be inserted into the duct.
- Place the O-Ring over the Sensor threads, against the 1 & 1/4 inch hex on the wiring side of the sensor.
- Insert the wiring side of the Sensor through the Gasket and Cover.
- Screw the Lock-Nut onto the wiring side of Sensor.
- Use the four Screws to attach the mounted Sensor to the duct. The Sensor should be oriented so that when the plate is attached to the duct the sensing element is inside the duct.

The Duct Mounting Plate (P/N 10041) is designed for use with General Monitors Catalytic Bead and MOS Sensors.

6.5 Calibration Equipment

General Monitors' Smart Sensors use Ampoules with a Breaker Bottle (figure 36) or the Portable Purge Calibrator (figure 37) to accomplish calibration. Refer to the instruction manual of the Smart Sensor for the specific calibration procedure when using the Portable Purge Calibrator.

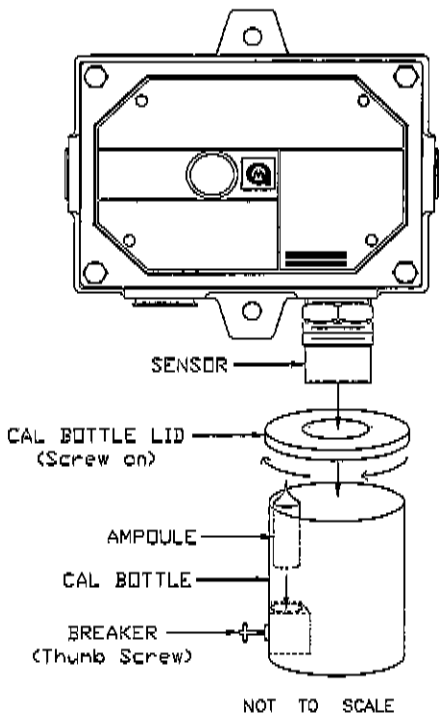


Figure 36

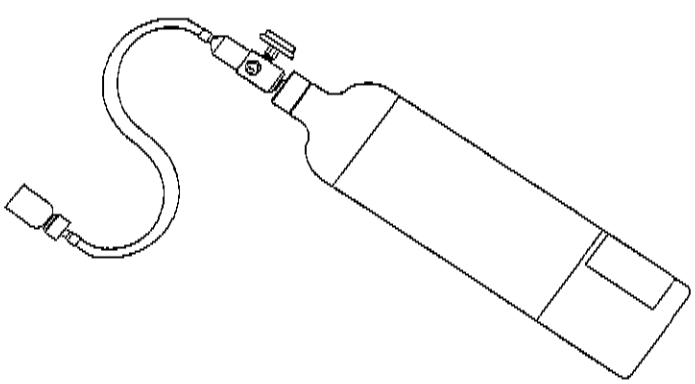
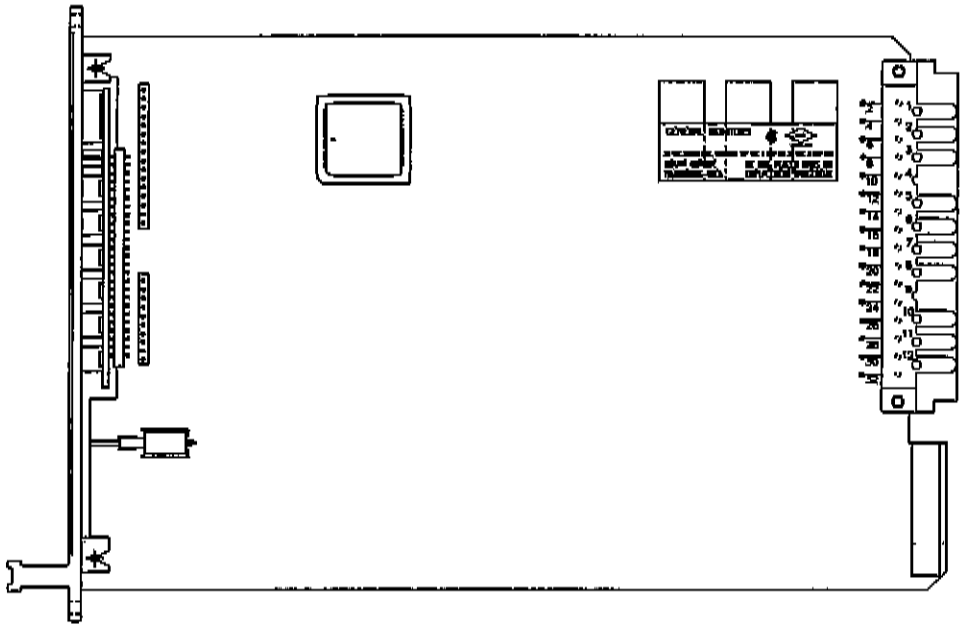


Figure 37

7.A Appendix
Engineering & Technical Drawings

Reference Drawing # 11301 Outline & Terminal Connections



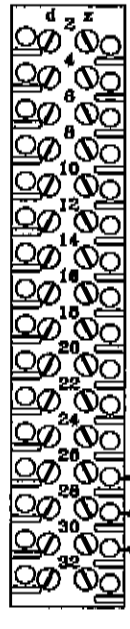
REAR CONNECTOR TERMINATIONS

d		z
A2 - C1	2	A1 - C1
A2 - 1	4	A1 - 1
A2 - 2	6	A1 - 2
A2 - 3	8	A1 - 3
A2 - 4	10	A1 - 4
A2 - C2	12	A1 - C2
A2 - OC	14	A1 - OC
CARDTEST	16	F - C
UA -OC	18	F - 1
4-20mA	20	F - 2
0V	22	F - OC
LA1	24	LA2
RED	26	GRN
WHT	28	BLK
N/C	30	N/C
FUA-OC/+24V	32	CAL-OC/COM

TA202A
RELAY CONTACTS

A1 C1 - COMMON FOR A1-1, A1-2 A1 C2 - COMMON FOR A1-3, A1-4		
RELAY STATE	NORMALLY OPEN	NORMALLY CLOSED
ENERGIZED	CONTACT 1 & 4	CONTACT 2 & 3
DE-ENERGIZED	CONTACT 2 & 3	CONTACT 1 & 4
A2 C1 - COMMON FOR A2-1, A2-2 A2 C2 - COMMON FOR A2-3, A2-4		
RELAY STATE	NORMALLY OPEN	NORMALLY CLOSED
ENERGIZED	CONTACT 1 & 4	CONTACT 2 & 3
DE-ENERGIZED	CONTACT 2 & 3	CONTACT 1 & 4

TA202A
REAR CONNECTOR



3 CONDUCTOR CABLE- DO NOT SPLICE CABLE UNLESS NECESSARY. ALL SPLICES MUST BE TIGHT AND SOLDERED.

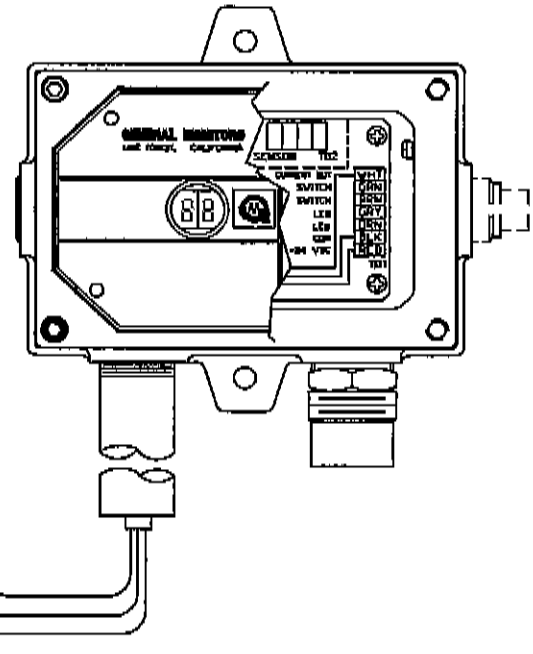


Figure 38

Engineering & Technical Drawings

Reference Drawing # 11300-1 Final Assembly

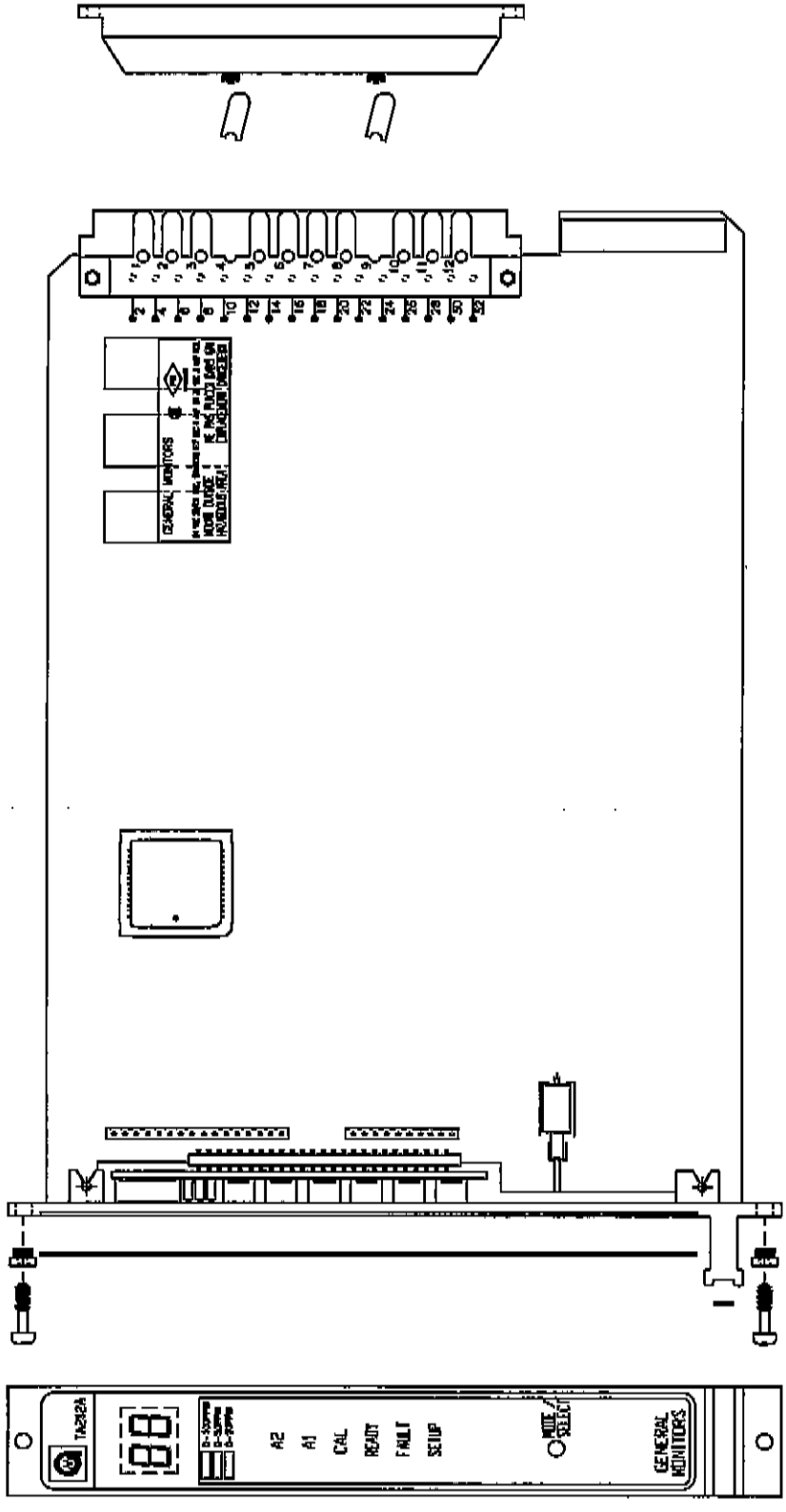


Figure 39